The Forest Health/Nutrition Experiment: Preliminary Root Chemistry Results

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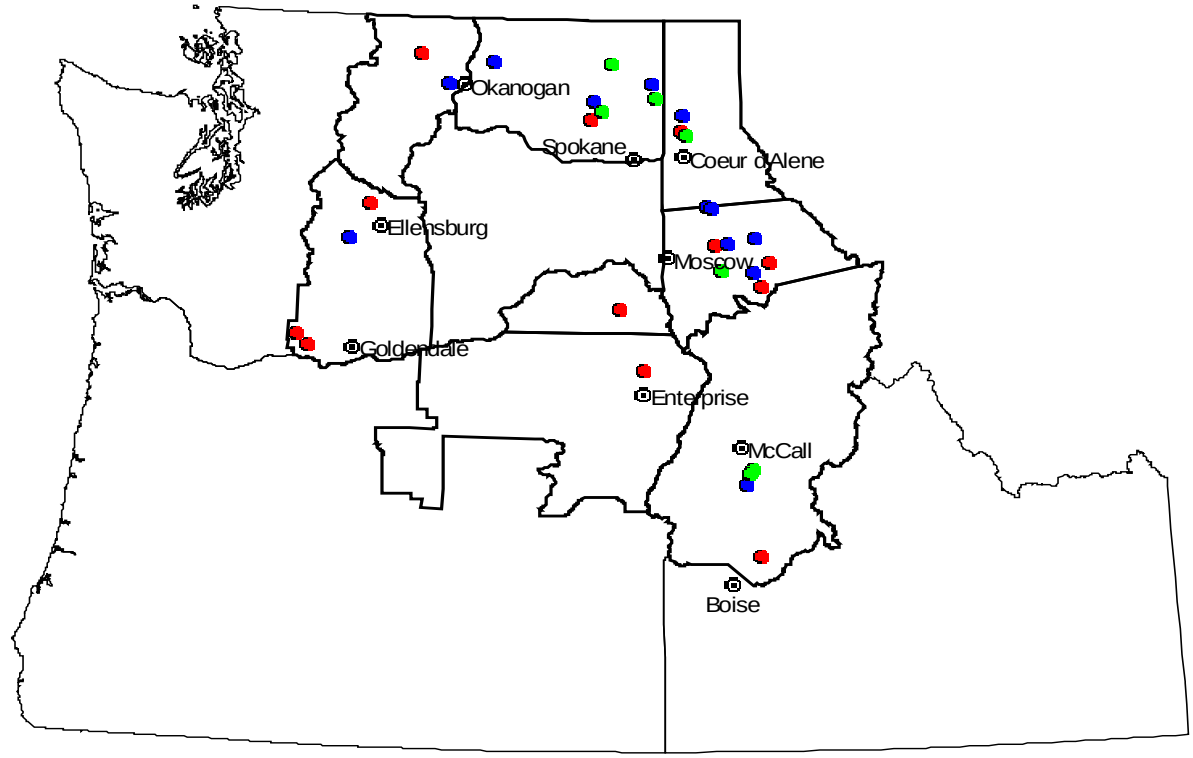
IFTNC Forest Health / Nutrition Experimental Locations (1994-1996)



Design of the experiment

- Sites stratified by 4 rock types and 3 vegetation types
- A core N and K 4-treatment experiment at all sites
- Additional fertilizer treatments tailored to site conditions
- Large experimental plots to monitor mortality

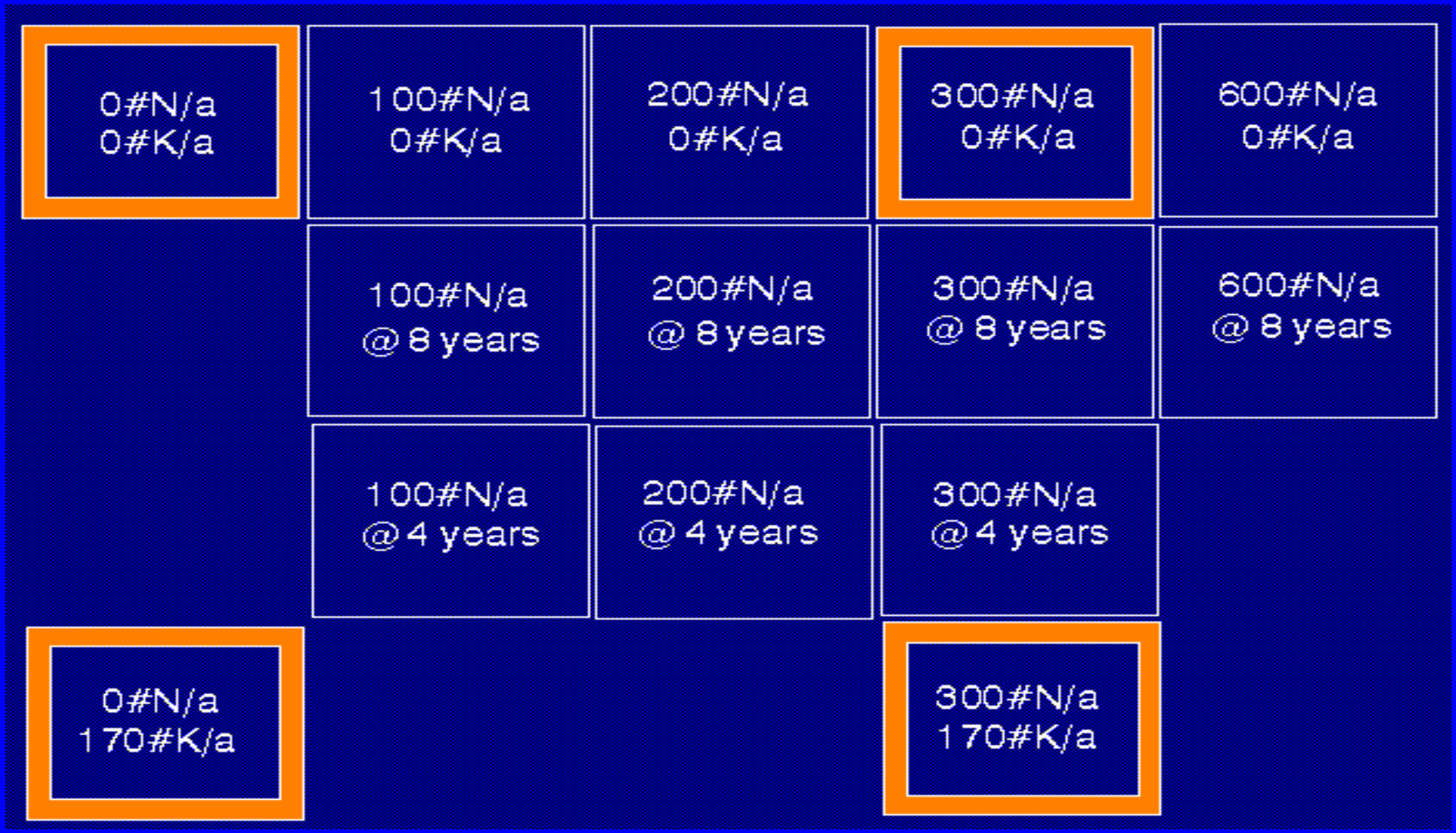
Sites Established: 1994-1996

by Rock Type and Vegetation Series

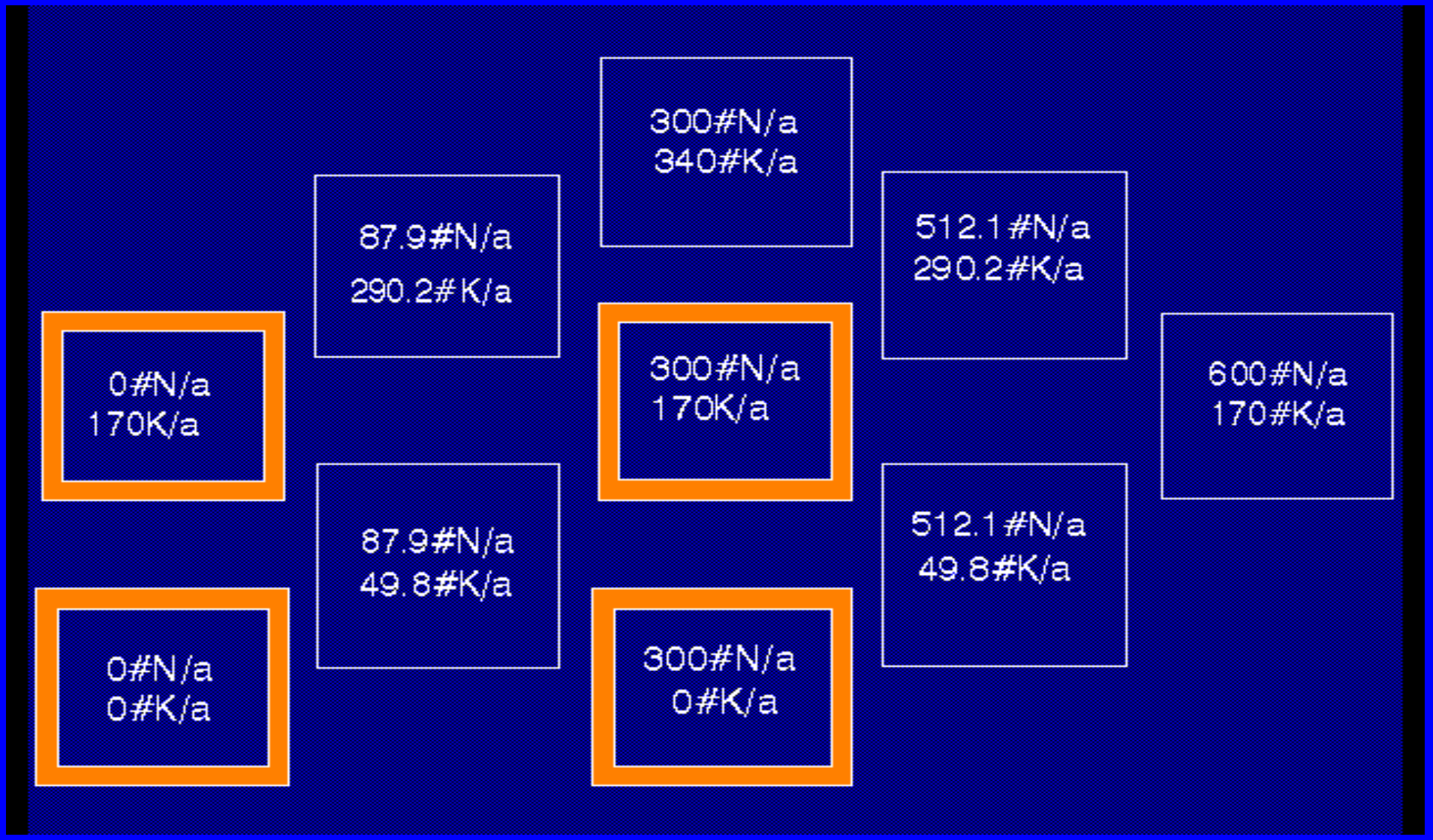
	Douglas-fir	Grand fir	Cedar/ Hemlock	TOTAL
Granite	K,B (1) K (2) N,B (1)	K (4)	K (2)	10
Basalt	N (1) R (2)	K (3)	N (1) R (2)	9
Metamorphic		K (1)	K (3)	4
Mixed	N (2)	K (2)	K (1) N (3)	8
TOTAL	9	10	12	31

N-Rate (N), Repeated N-Rate (R), N-K Response Surface (K), Bark Beetle (B)

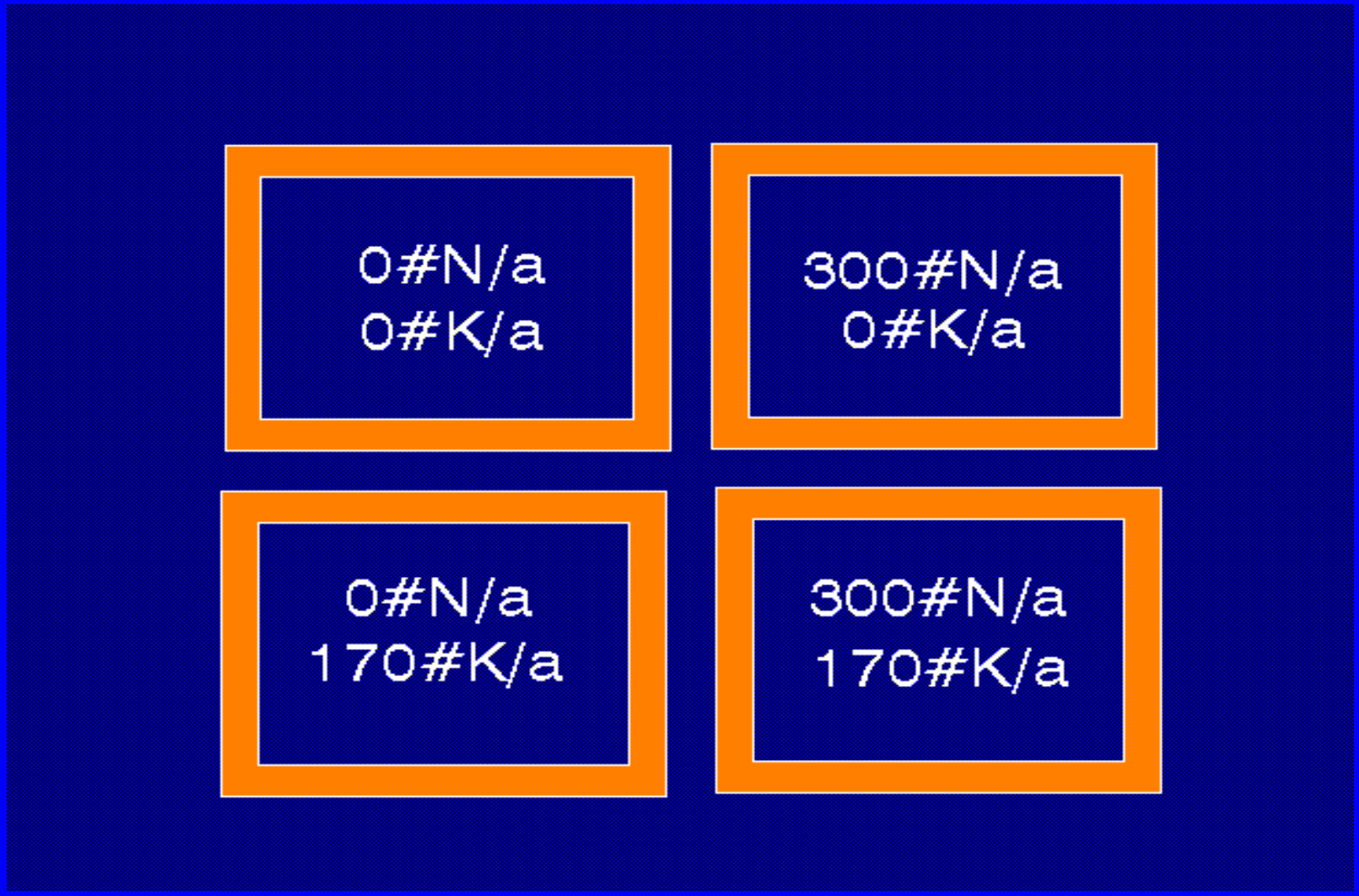
Nitrogen Rate Design



N-K Response Surface Design



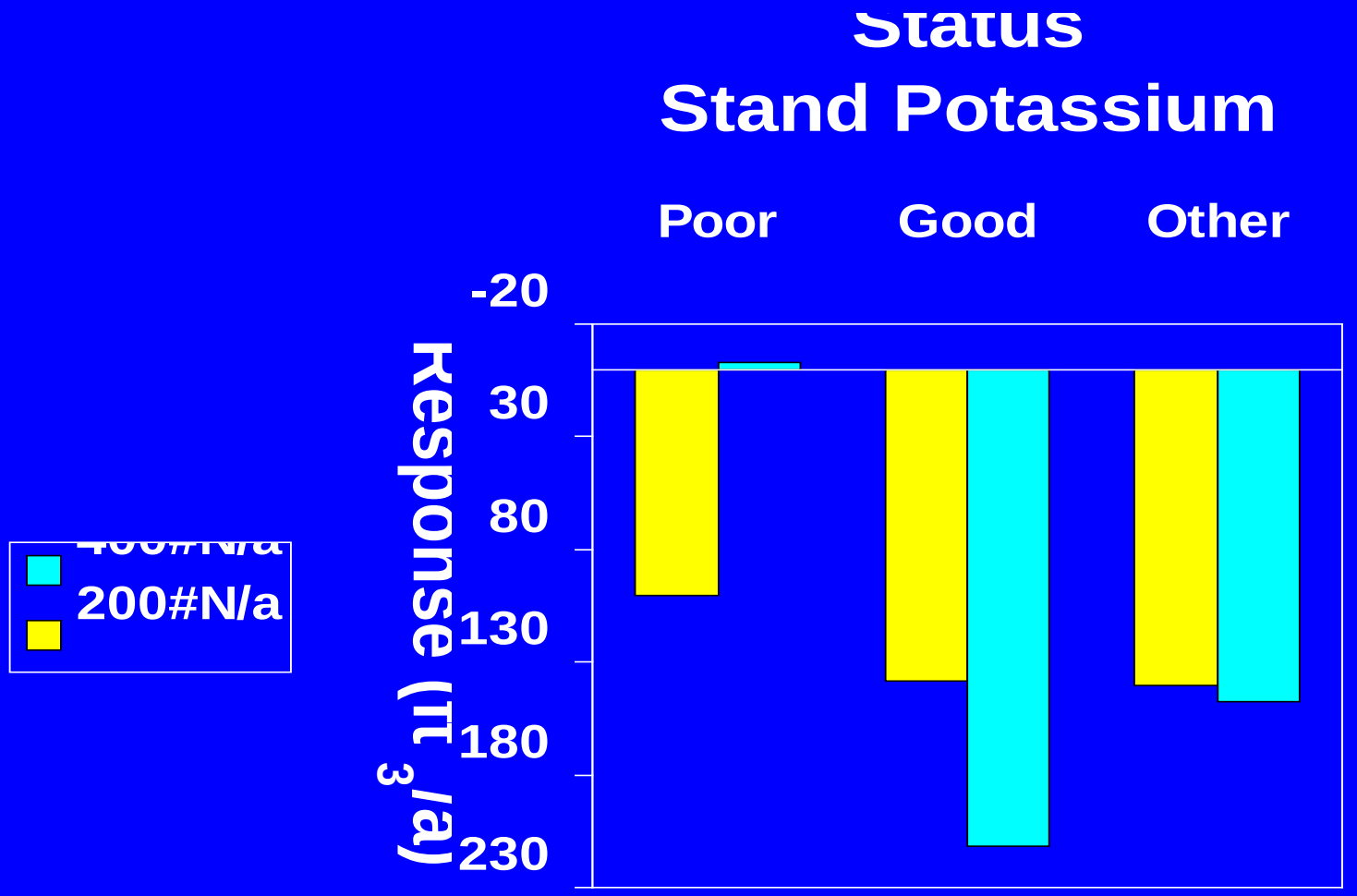
Core Design



Today's Topic: DF Root Chemistry

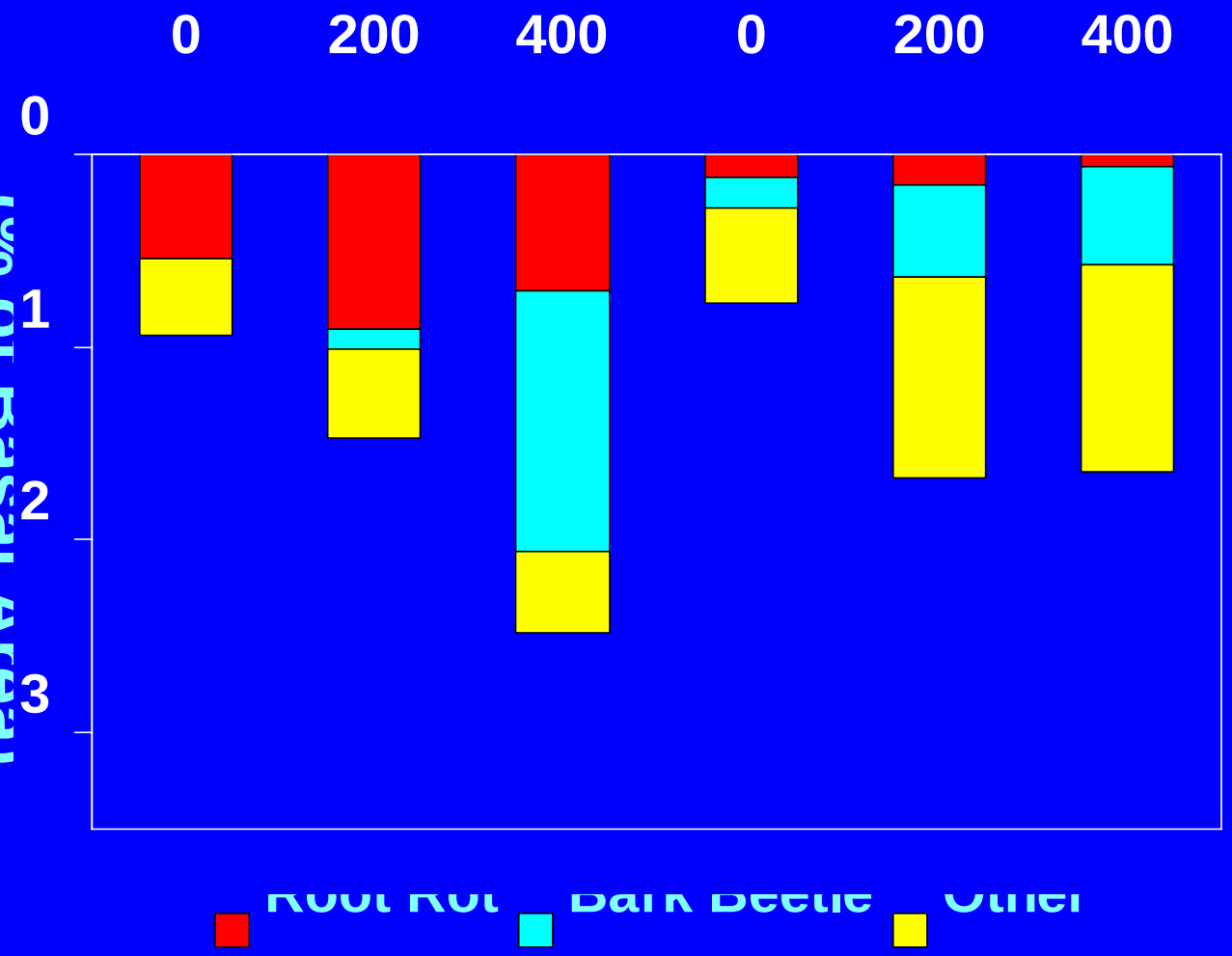
- Background
- Sample Collection and Chemical Analysis
  - Sugars, Starchs, Phenols, and Tannins
- Results of Statistical Analysis
  - Fertilizer Treatment Effects
  - Influence of Time Since Treatment
  - Influence of Site Conditions:
    - Rock Type
    - Vegetation Series

6-YEAR NET VOLUME RESPONSE
By K Status and Treatment

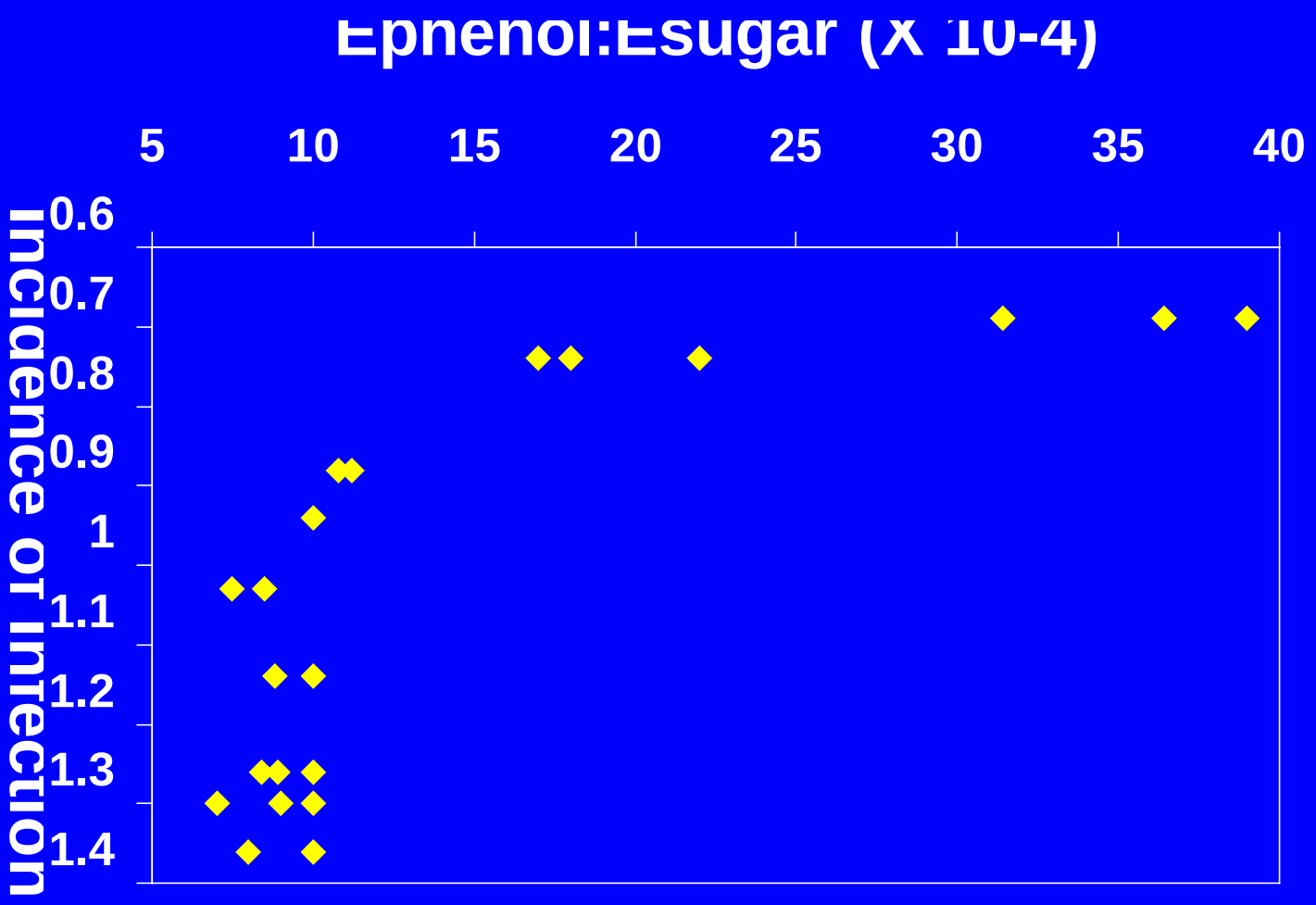


Douglas-fir in the Intermountain Region

6-year Mortality

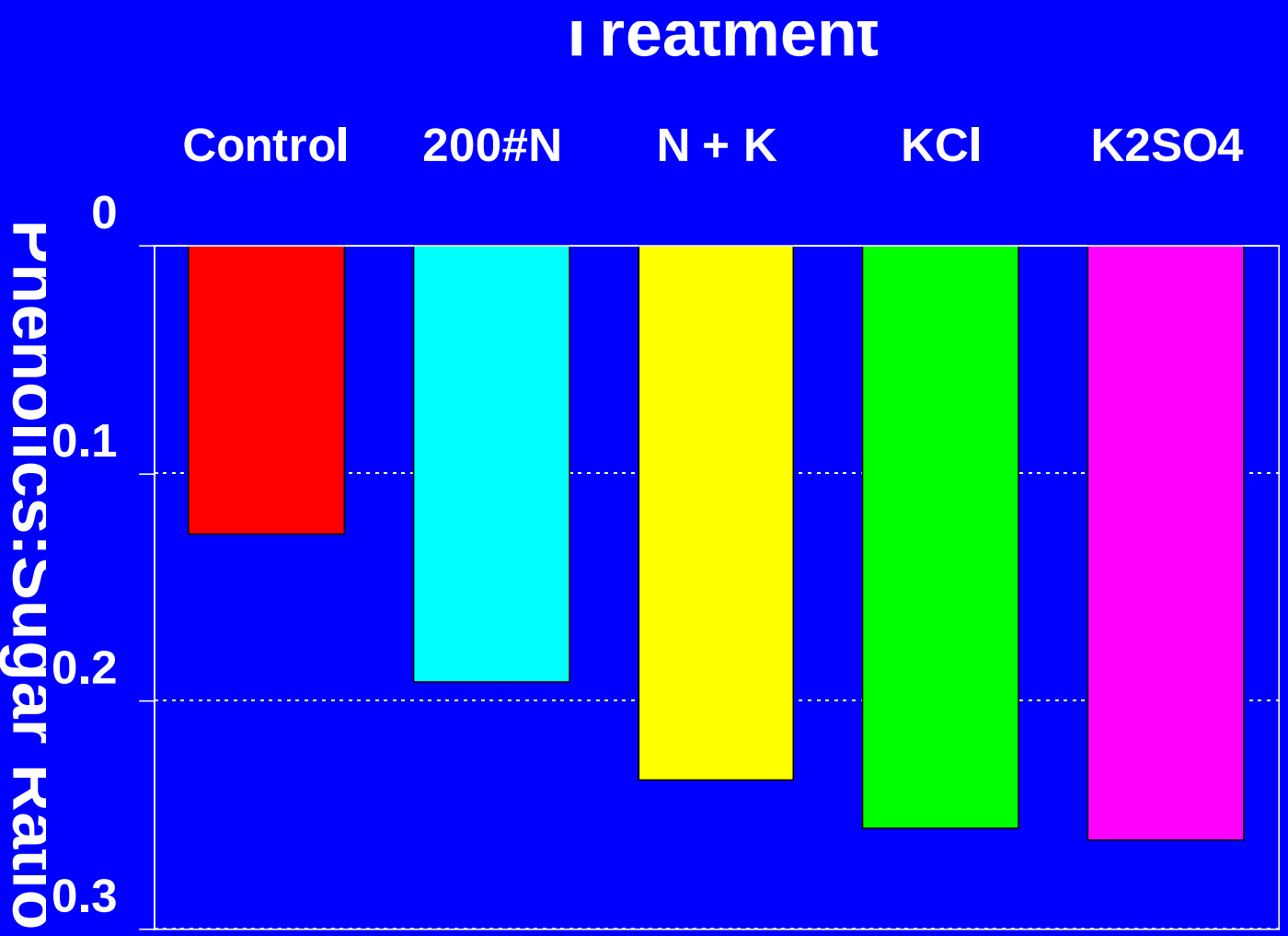


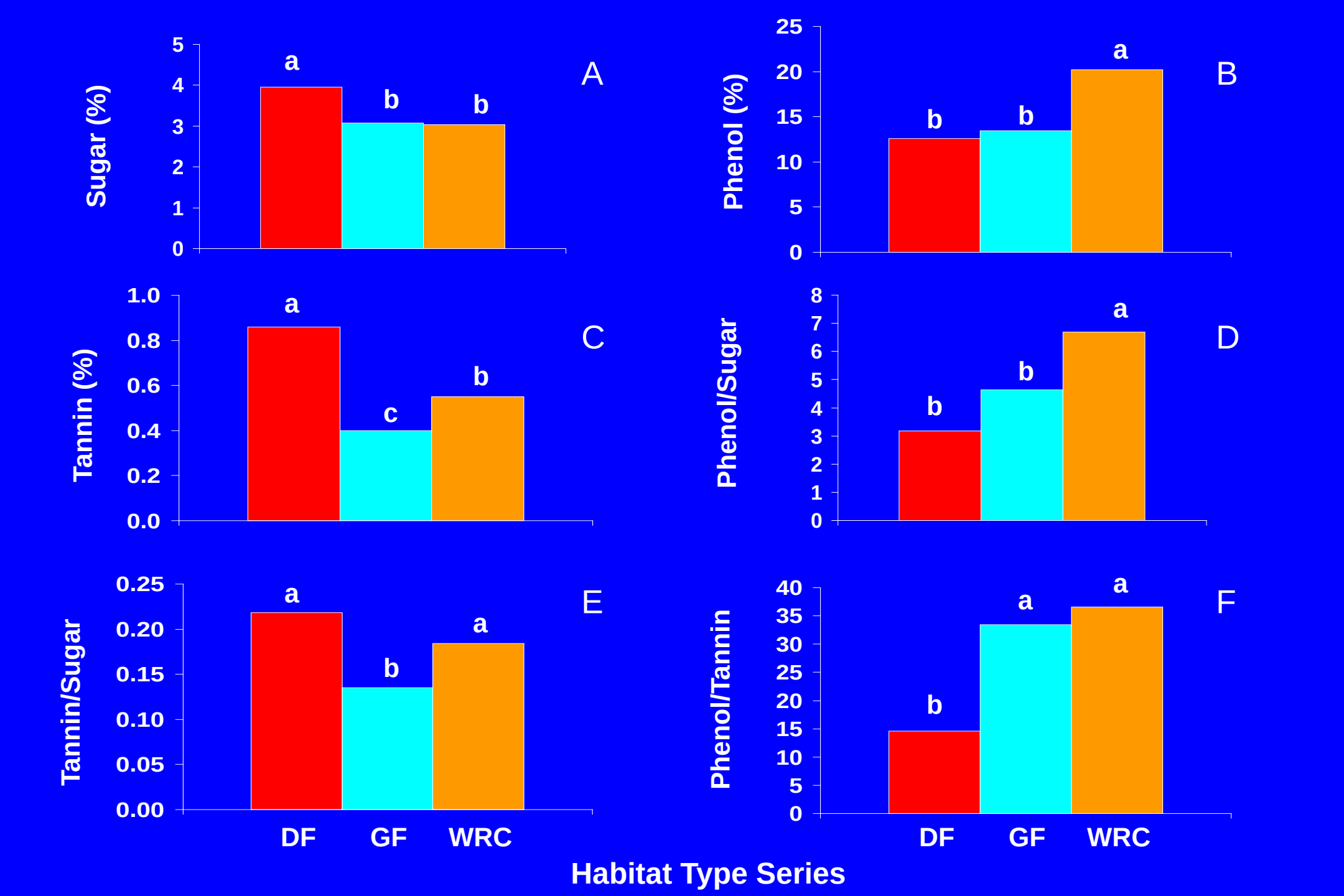
ARMILLARIA INFECTION RATE
Relationship to Thermochemical Budget



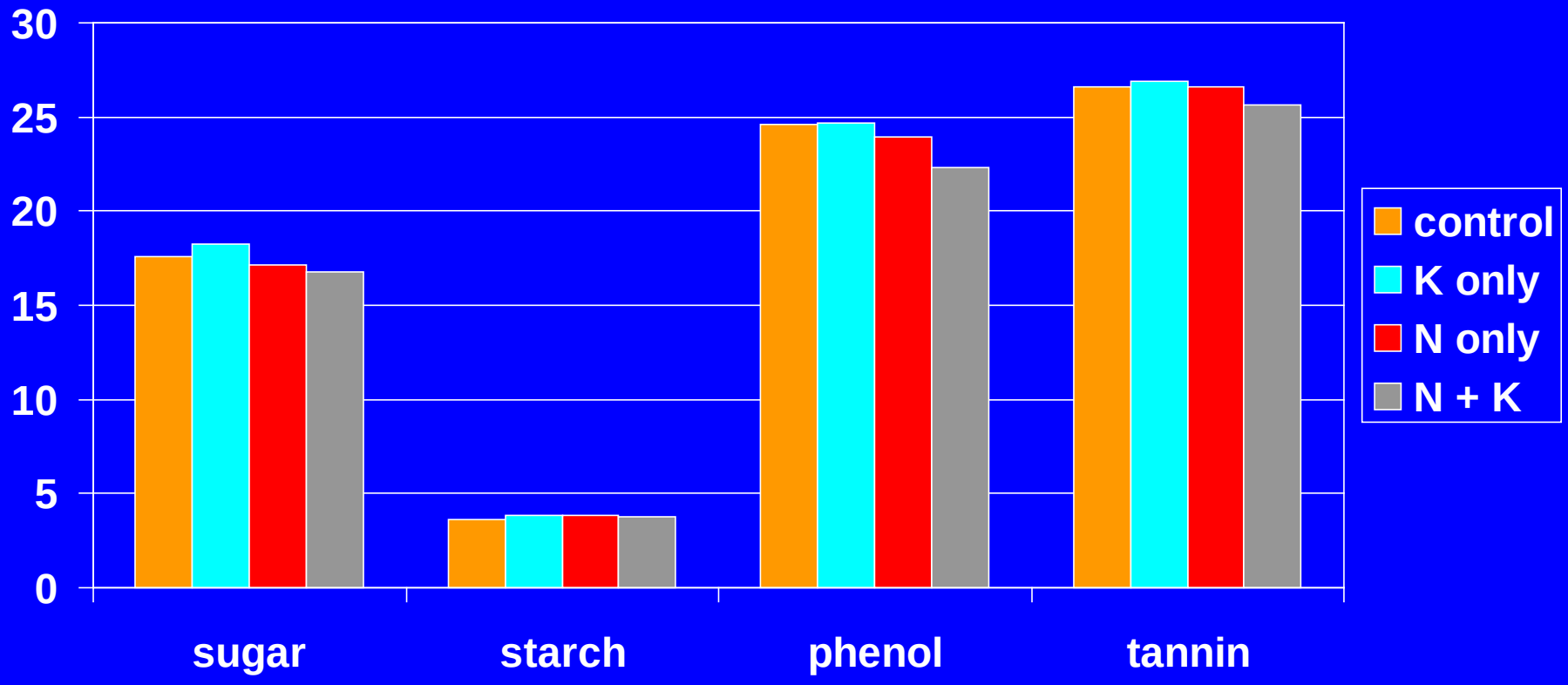
Adapted from Entry *et al* 1991

ROOT PHENOLICS:SUGAR RATIOS
Grangemont Root Rot Study

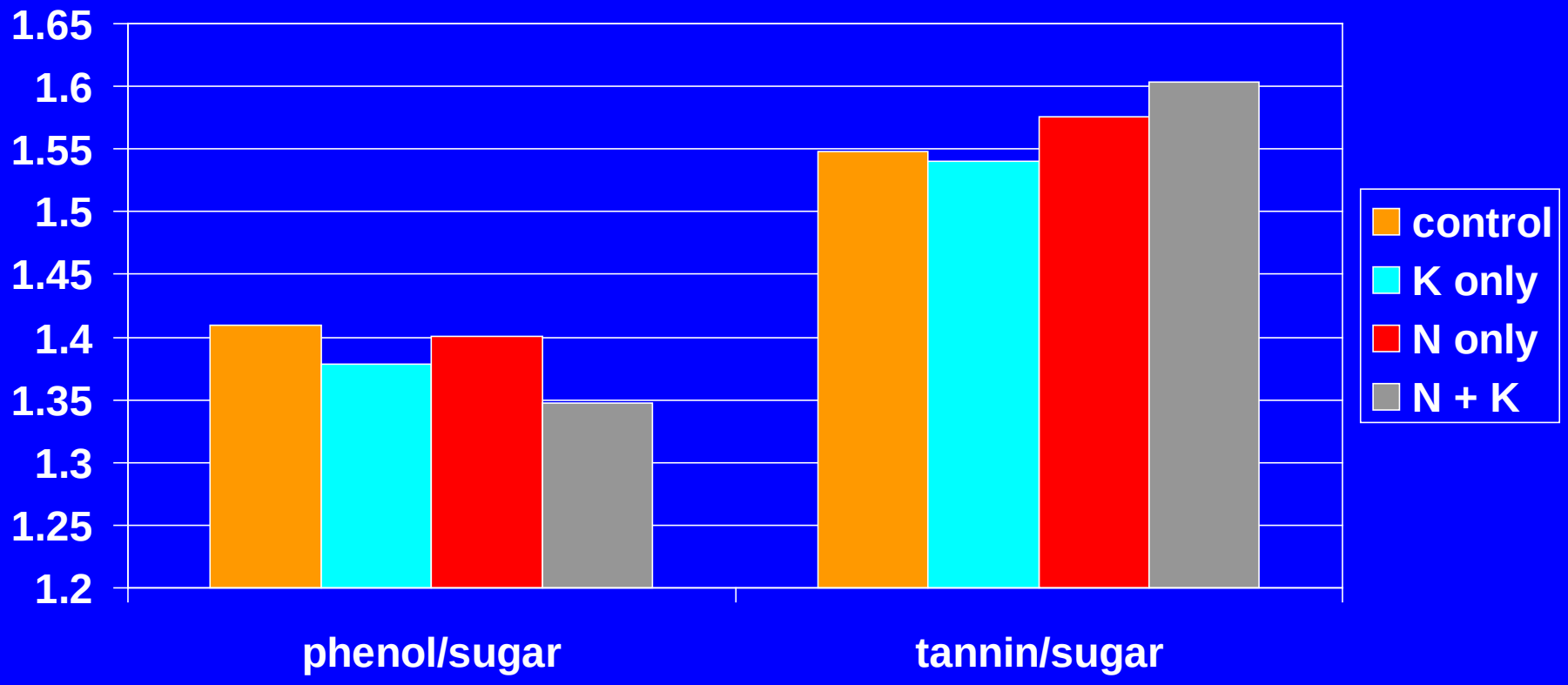



Sugar (%)
5
4
3
2
1
0
a
b
b
A
Phenol (%)
25
20
15
10
5
0
b
b
a
B
Tannin (%)
1.0
0.8
0.6
0.4
0.2
0.0
a
c
b
C
Phenol/Sugar
8
7
6
5
4
3
2
1
0
b
b
a
D
Tannin/Sugar
0.25
0.20
0.15
0.10
0.05
0.00
a
b
a
E
Phenol/Tannin
40
35
30
25
20
15
10
5
0
b
a
a
F
DF
GF
WRC
DF
GF
WRC
Habitat Type Series

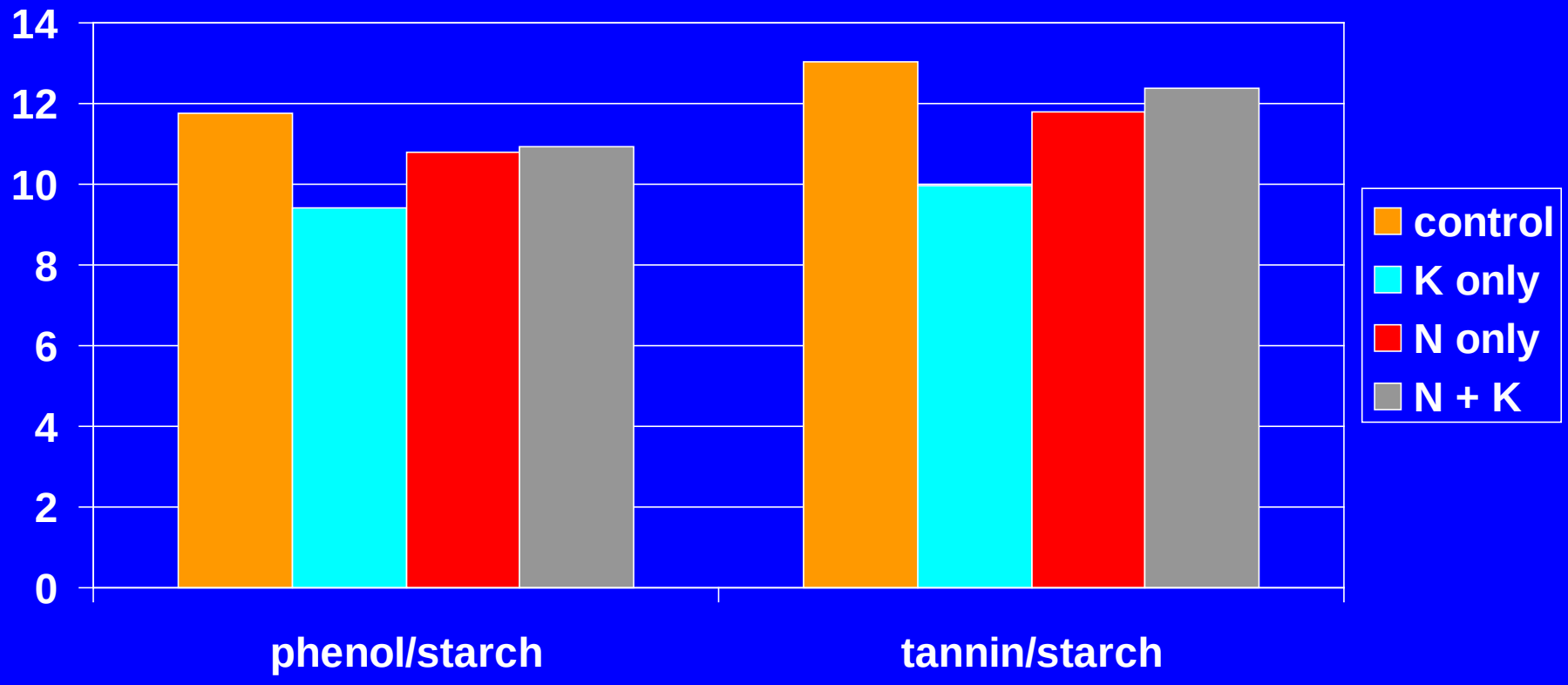
Root Chemistry by Treatment



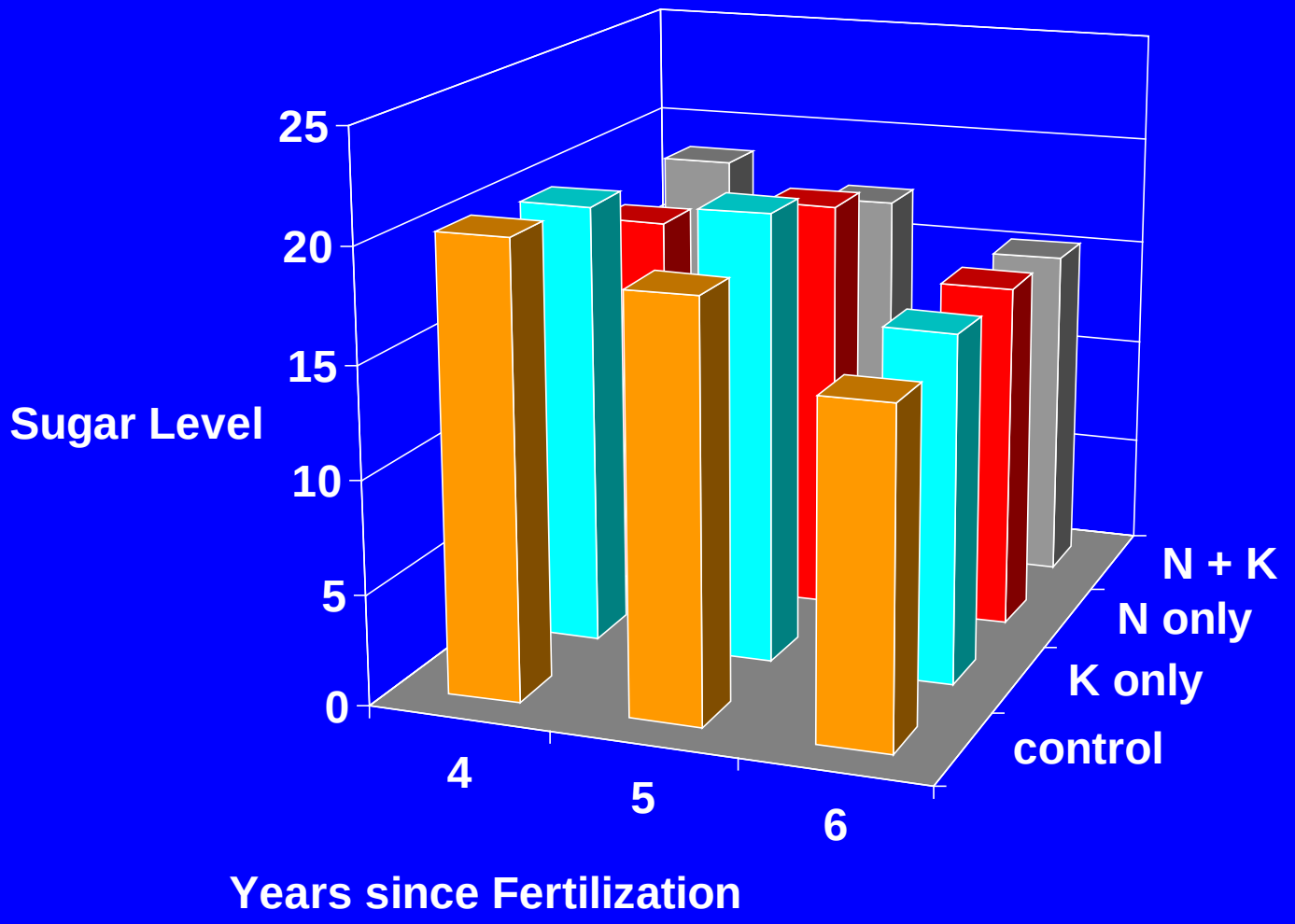
Root Chemistry Ratios by Treatment



Root Chemistry Ratios by Treatment



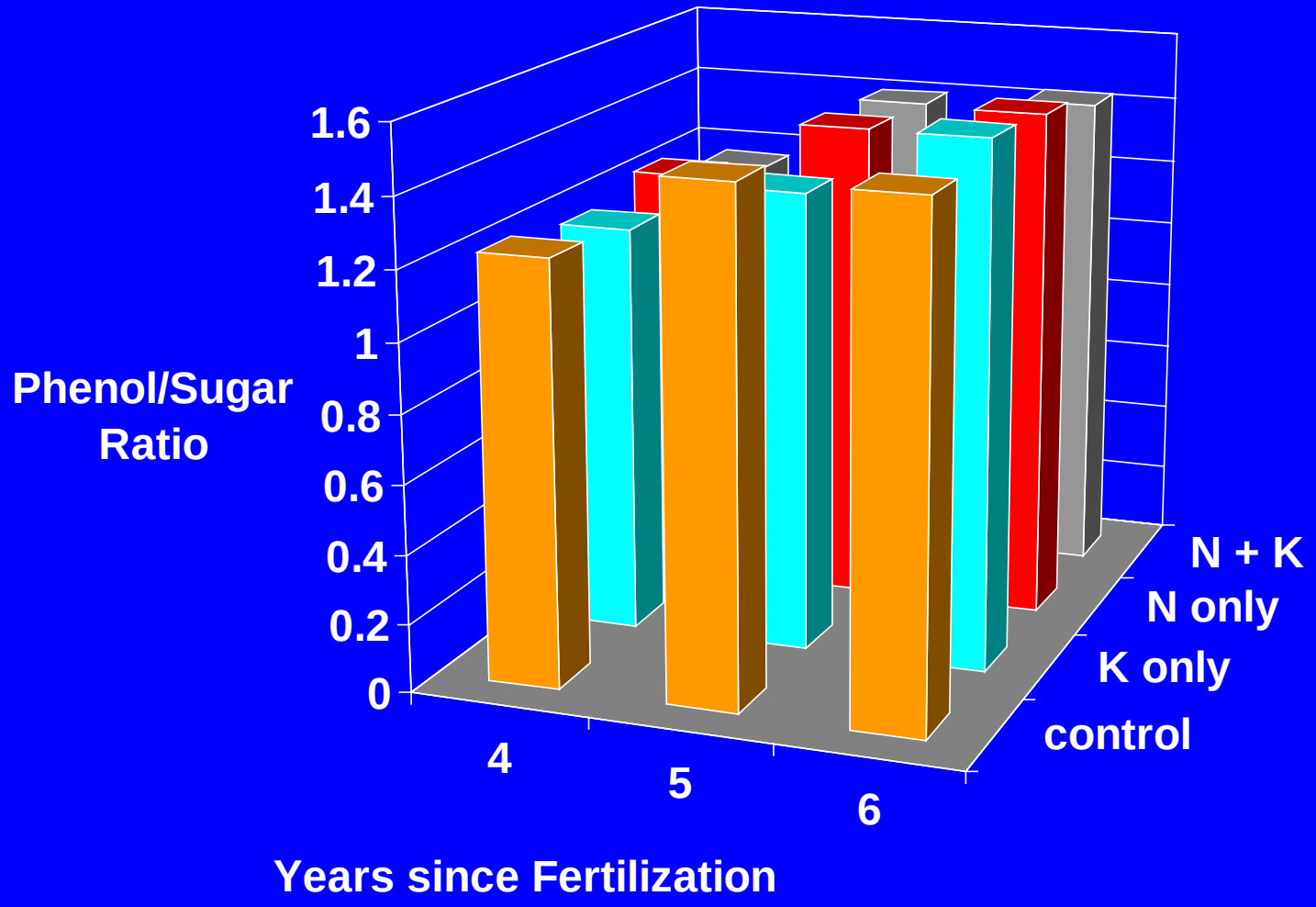
Root Sugar by Treatment and Years Since Fertilization



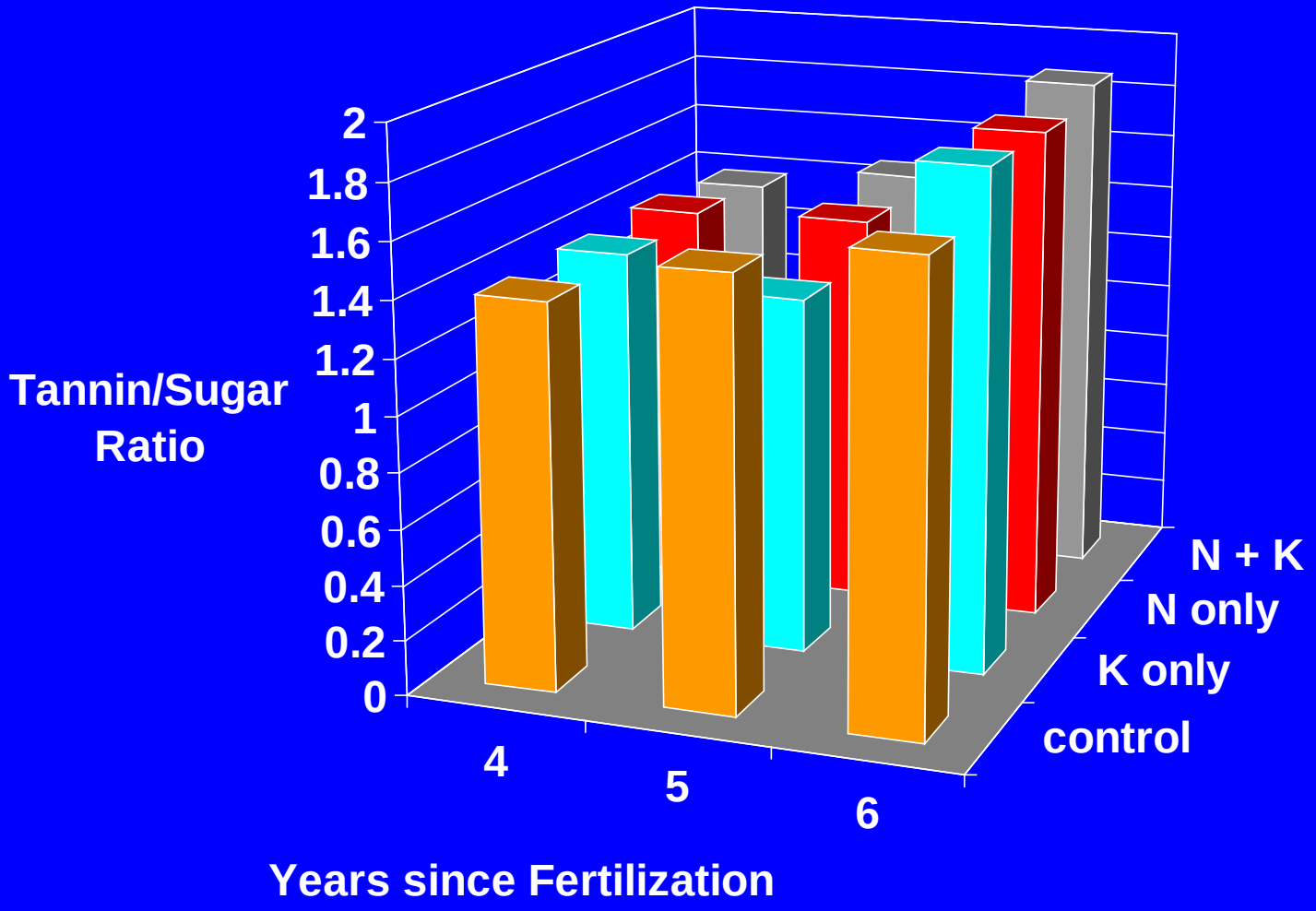
Sites Sampled

	Vegetation Series								
	DF			GF			WRC/WH		
	Years Since Fertilization								
	6	5	4	6	5	4	6	5	4
Basalt	2			1				1	
Granite	1	1				1	1		
Mixed		1				2	1		1
Metamorphic					1			1	

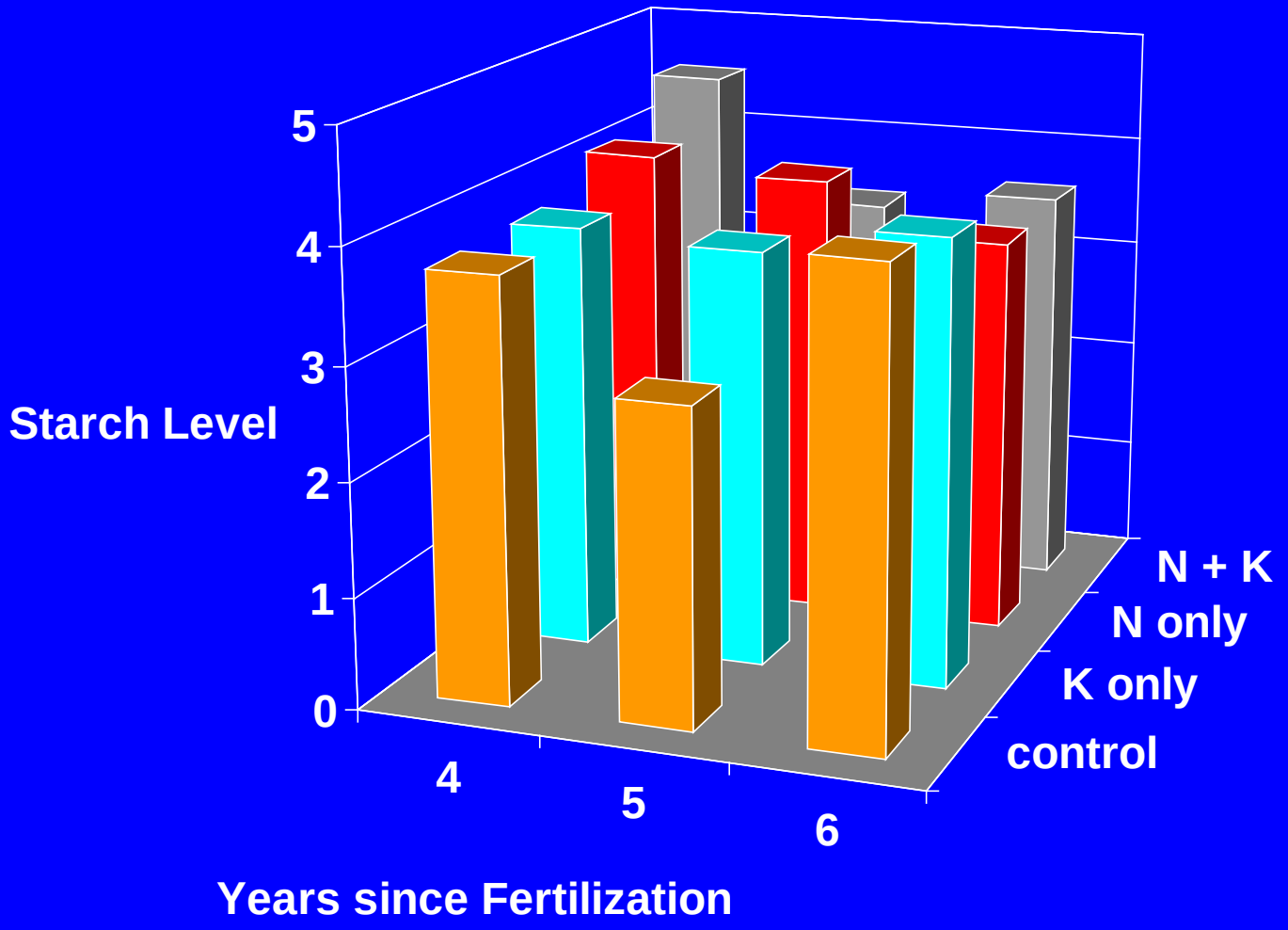
Root Phenol/Sugar Ratios by Treatment and Years Since Fertilization



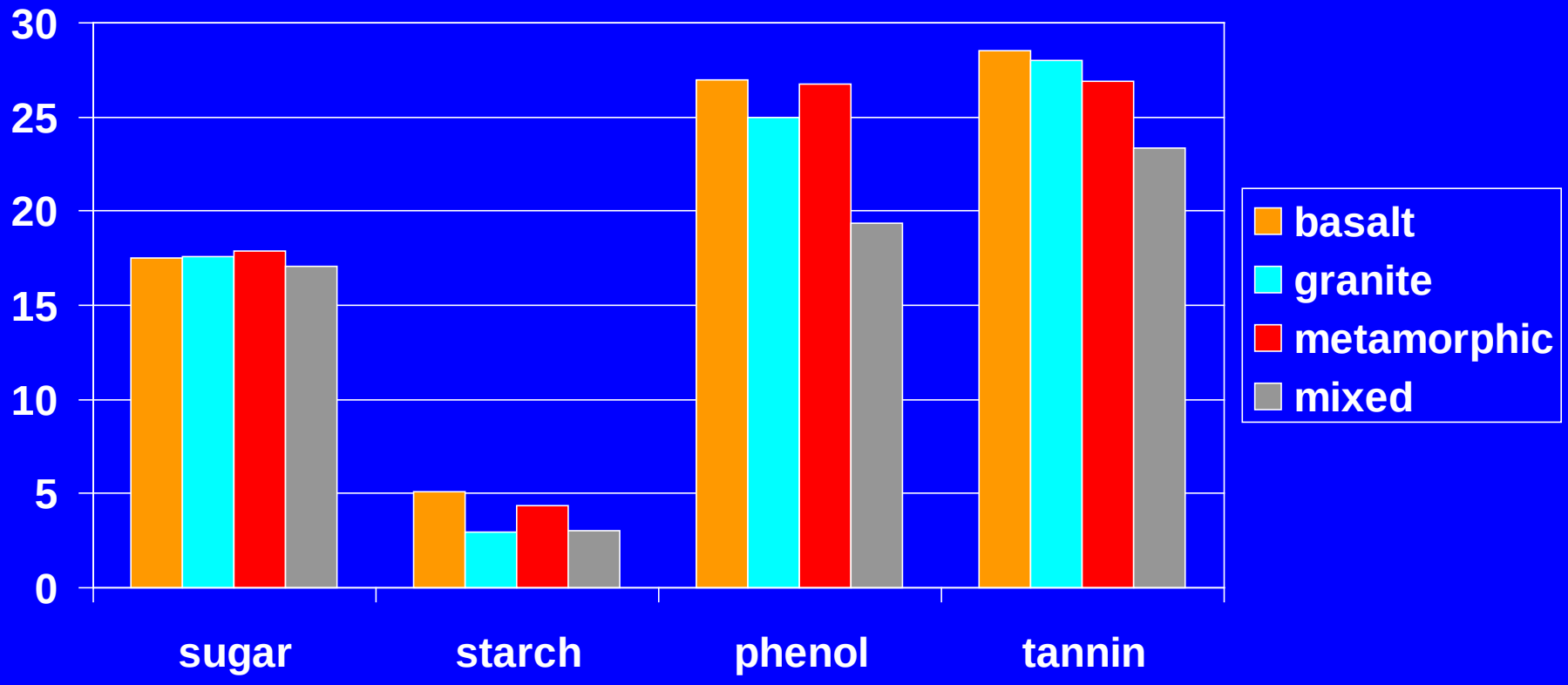
Root Tannin/Sugar Ratios by Treatment and Years Since Fertilization



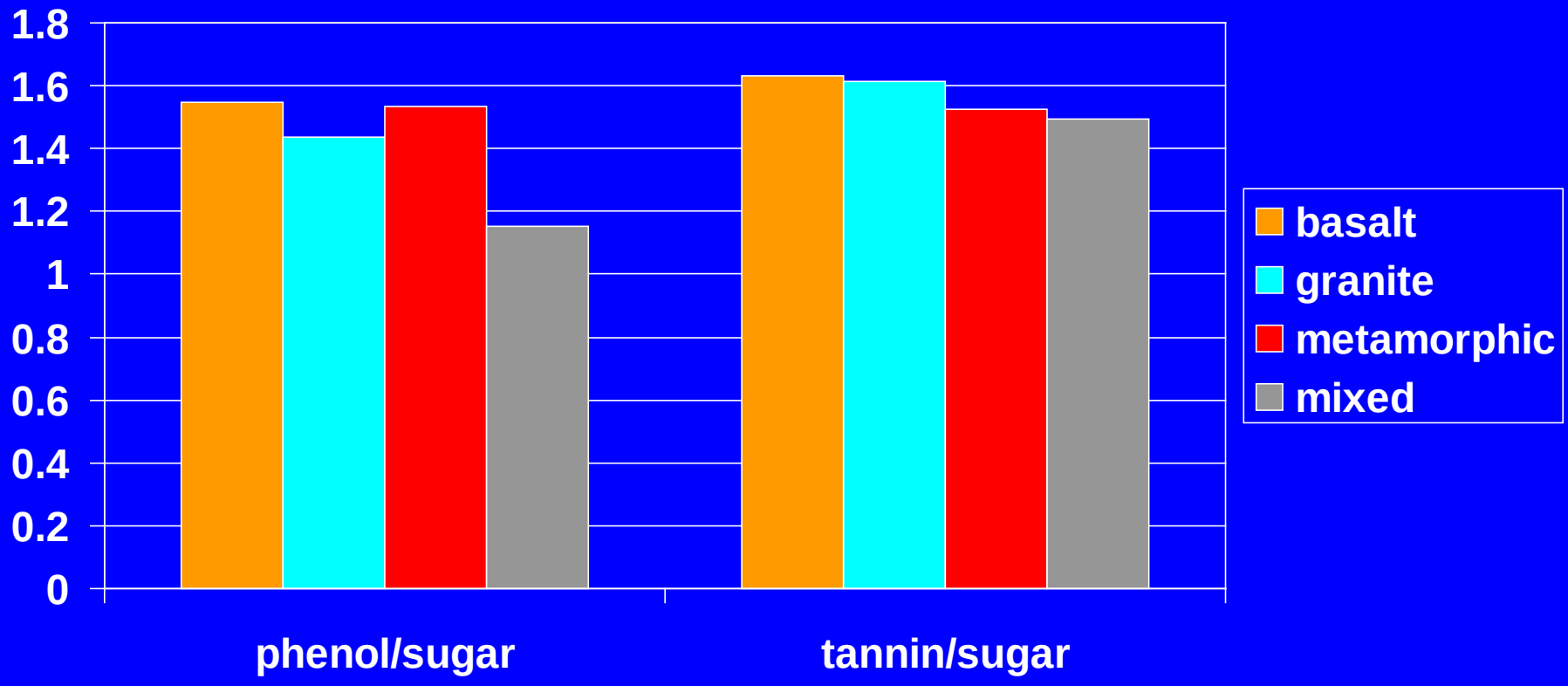
Root Starch by Treatment and Years Since Fertilization



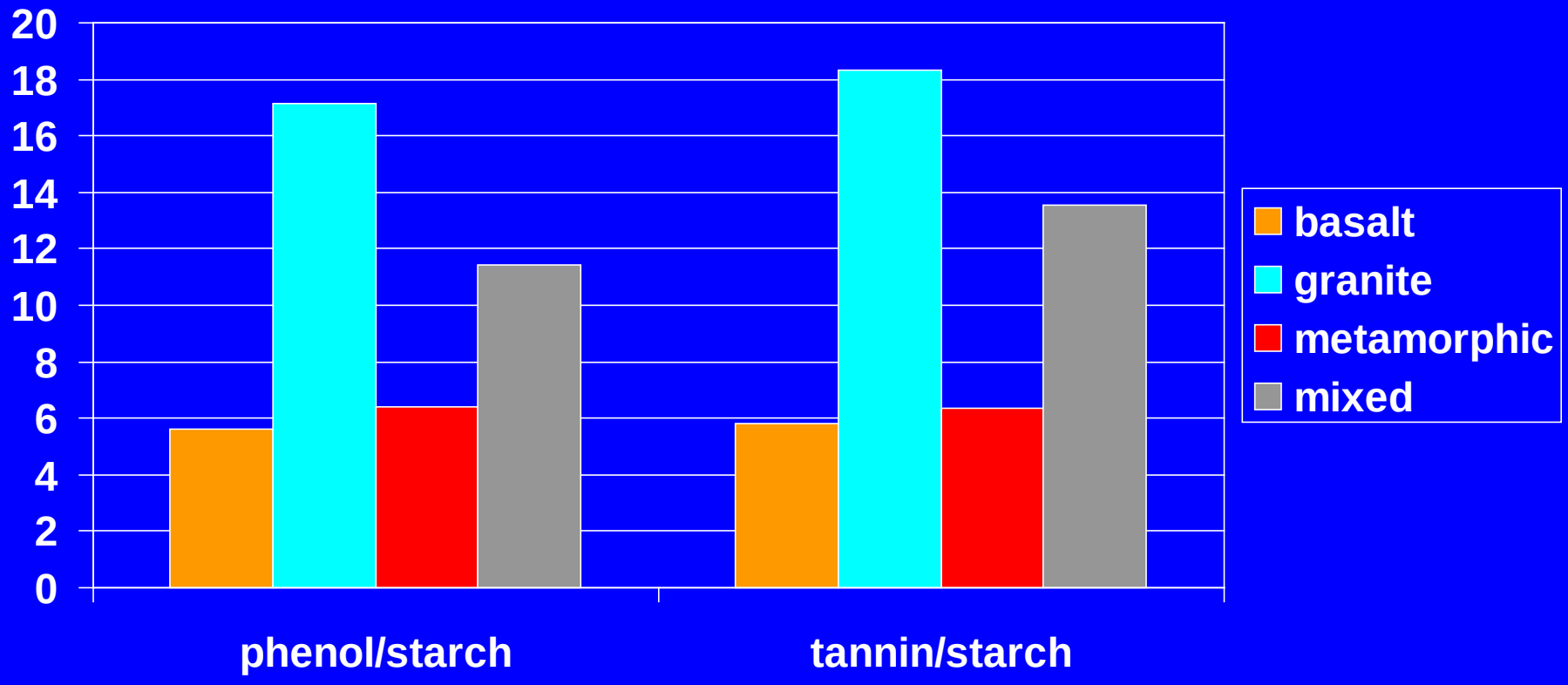
Root Chemistry by Rock Type



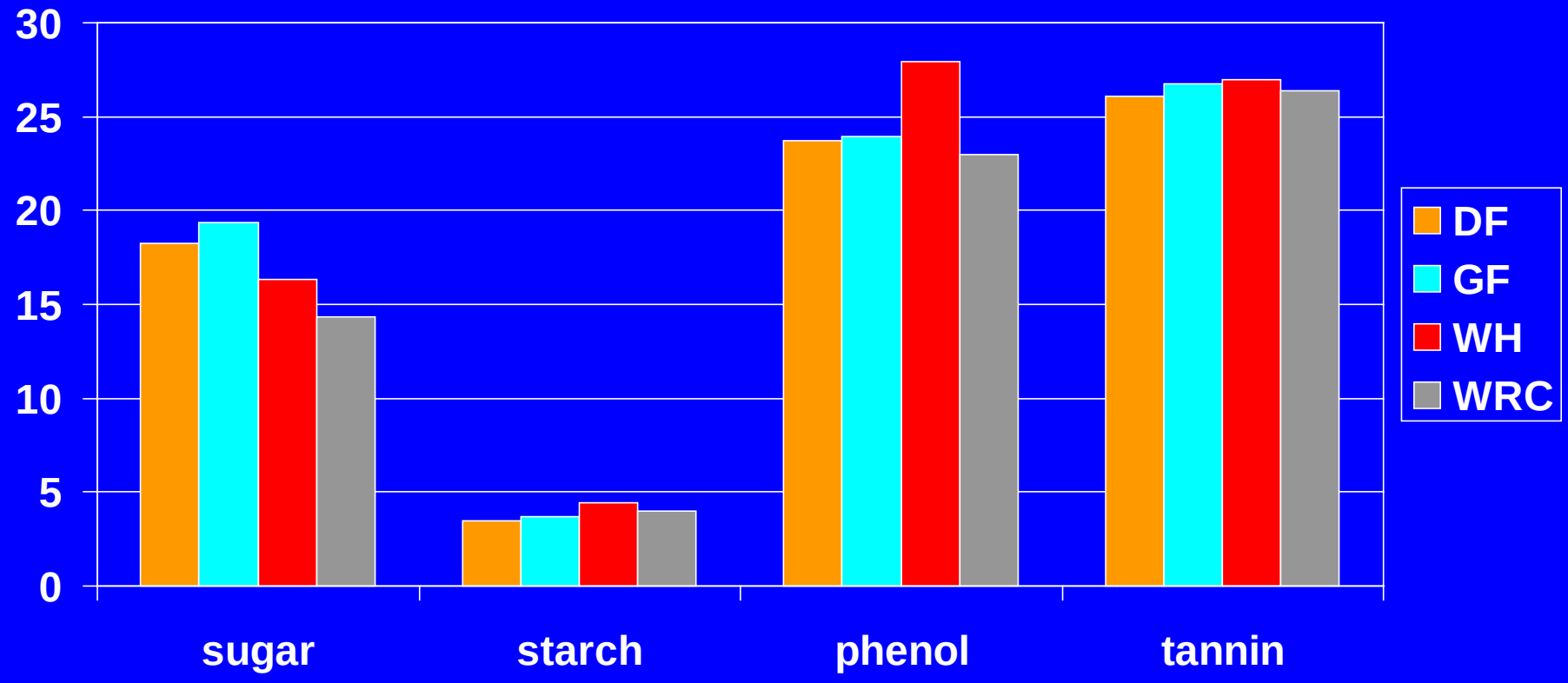
Root Chemistry Ratios by Rock Type



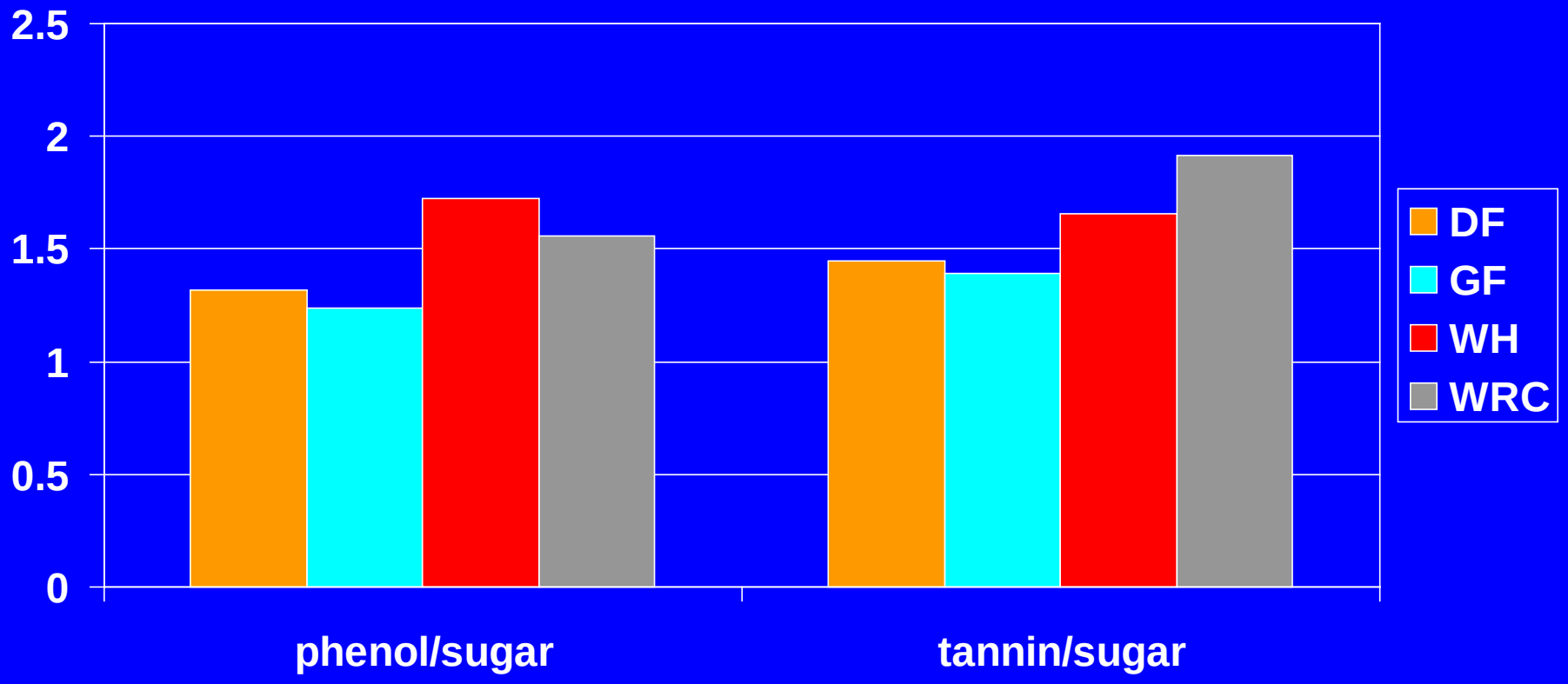
Root Chemistry Ratios by Rock Type



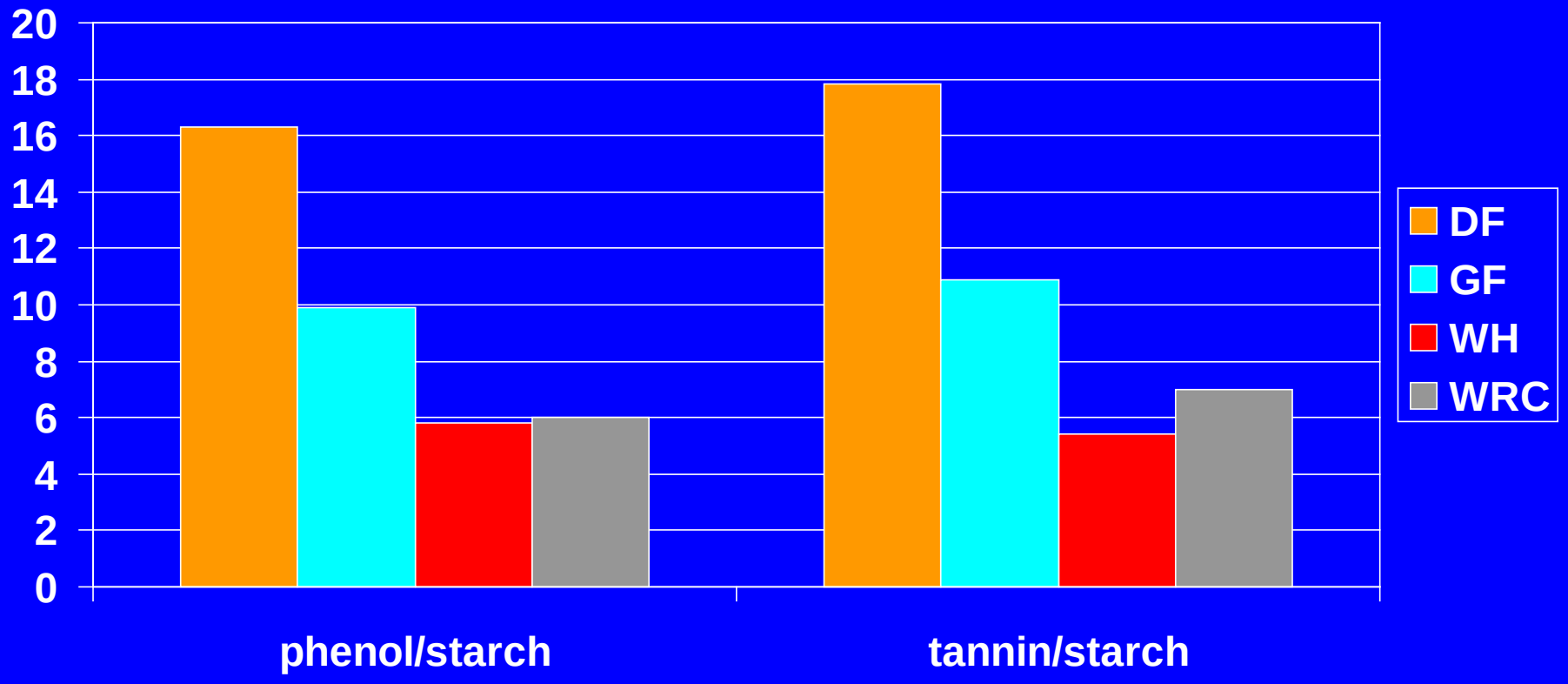
Root Chemistry by Vegetation Series



Root Chemistry Ratios by Vegetation Series



Root Chemistry Ratios by Vegetation Series



Conclusions

- Some evidence that fertilization does impact root chemistry, but effects may be short-lived.
- Root chemistry does vary significantly across rock types and vegetation types.
  - Sites on granites and glacial tills appear to be different than those on basalts and metamorphics.
  - Generally, root chemistries on DF and GF sites tend to be similar to each other but different than those on WRC and WH sites.